[1]   A tomogram reconstruction method making a radiation source and a detector disposed to be opposite to each other interposing a scanning object therebetween revolve around a predetermined revolving axis, detecting the penetrated radiation irradiated from the radiation source and transmitted through the object, and creating a tomogram of the region of interest of the object from the detected projection data including:

a step for obtaining the weighting factor in compliance with a correction angle width and a projection data angle using for back-projection of the projection data;

a step for obtaining the projection data on which the weighting process based on the weighting factor relating to said projection data is implemented and weighted; and

a step for reconstructing the tomogram using the weighted projection data.

[2]   The tomogram reconstruction method according to claim 1, including:

a step for setting correction angle width and/or the projection data angle for back-projection; and

a step for setting the value of the other step out of the correction angle width or the projection data angle for

back-projection based on the value of the set width in the previous step.

[3] The tomogram reconstruction method according to claim 2, wherein the correction angle width and the projection data angle for back-projection are set to be $0 \leqq \varepsilon \leqq \pi \neq (2F-1)$ (only $\varepsilon \neq 2F-2^{ceil(log2F)}$) when the correction angle width is set as $\varepsilon \pi$ and the projection data angle for back-projection as $2F\pi$.

[4] The tomogram reconstruction method according to claim 2, wherein the correction angle width is set corresponding to the range of the region for correcting the discontinuity of data (hereinafter referred to as "the data discontinuity region") in the end portion of the projection data.

[5] The tomogram reconstruction method according to claim 2, wherein the correction angle width is changed according to the size of noise quantity in the reconstructed image.

[6] The tomogram reconstruction method according to claim 2, wherein the correction angle width is changed according to the size of the motion artifact in the reconstructed image.

[7] The tomogram reconstruction method according to claim 2,

57

wherein the correction angle width is increased or decreased

by making it directly proportional to the projection data angle

for back-projection.

[8]   The tomogram reconstruction method according to claim 2,

wherein the projection data angle for back-projection is set

at an arbitrary angle that is more than the data width [π +

twice the value of the maximum fan angle] of the minimum complete

data set.

[9]   The tomogram reconstruction method according to claim 1,

wherein the weighting function is such that the weight in the

discontinuity region including the end portion of the data is

smaller than the weight in the other region equivalent of the

relevant discontinuity region.

[10]   The tomogram reconstruction method according to claim 9,

wherein the weighting function is created by adding and

normalizing the first sub weighting function and the second sub

weighting function which is created by shifting the first sub

weighting function for a predetermined phase.

[11]   The tomogram reconstruction method according to claim 10,

wherein the sub weighting function has the trapezoidal shape

of which the upper hem is $[\pi - \varepsilon \pi]$ and the bottom is $[\pi + \varepsilon \pi]$.

[12] The tomogram reconstruction method according to claim 1 further comprises a step for performing a rearrangement process to rearrange the fan beam radiated from the radiation source to the parallel beam, wherein weighting functions $w(\theta)$ for reconstructing with the parallel beam when the revolution phase at the time of detecting the projection data is set as θ and using N which can be obtained from the correction angle width $\varepsilon \pi$ [rad] and $2^{(N-1)} \leqq F - \varepsilon /2 < 2^N$ (N is an integer of more than 0) are:

[Formula 1A]

$w(\theta) = 0$

$\qquad\qquad\qquad$ if $[\theta < P_0 \pi]$

$w(\theta) = (P_7 \pi + \theta) W1 / (\varepsilon \pi)$

$\qquad\qquad\qquad$ if $[P_0 \pi \leqq \theta < P_1 \pi, \varepsilon > 0]$

$w(\theta) = 0$

$\qquad\qquad\qquad$ if $[P_0 \pi \leqq \theta < P_1 \pi, \varepsilon = 0]$

$w(\theta) = W1*V2*2/\varepsilon$

$\qquad\qquad\qquad$ if $[P_1 \pi \leqq \theta < P_2 \pi, \varepsilon > 0, V1=0]$

$w(\theta) = ((\theta - P_1 \pi)*(W1*4/\varepsilon)/2\pi) + W1*V2*2/\varepsilon$

$\qquad\qquad\qquad$ if $[P_1 \pi \leqq \theta < P_2 \pi, \varepsilon > 0, V1 \neq 0]$

$w(\theta) = W1$

$$\text{if } [P_1 \pi \leqq \theta < P_2 \pi \text{ , } \varepsilon = 0]$$

$$w(\theta) = W1$$

$$\text{if } [P_1 \pi \leqq \theta < P_2 \pi \text{ , } \varepsilon = 0]$$

$$w(\theta) = ((\theta - P_3 \pi) * W1 / (\varepsilon \pi)) + W2$$

$$\text{if } [P_2 \pi \leqq \theta < P_3 \pi \text{ , } \varepsilon > 0]$$

$$w(\theta) = W2$$

$$\text{if } [P_3 \pi \leqq \theta < P_4 \pi]$$

$$w(\theta) = ((P_4 \pi - \theta) * W1 / (\varepsilon \pi)) + W2$$

$$\text{if } [P_4 \pi \leqq \theta < P_5 \pi \text{ , } \varepsilon > 0]$$

$$w(\theta) = W1 * V2 * 2 / \varepsilon$$

$$\text{if } [P_5 \pi \leqq \theta < P_6 \pi \text{ , } \varepsilon > 0 \text{, } V1 = 0]$$

$$w(\theta) = ((P6 \pi - \theta) * (W1 * 4 / \varepsilon) / 2 \pi) + W1 * V2 * 2 / \varepsilon$$

$$\text{if } [P_5 \pi \leqq \theta < P_6 \pi \text{ , } \varepsilon > 0 \text{, } V1 \neq 0]$$

$$w(\theta) = W1$$

$$\text{if } [P_5 \pi \leqq \theta < P_6 \pi \text{ , } \varepsilon = 0]$$

$$w(\theta) = (P_7 \pi - \theta) W1 / (\varepsilon \pi)$$

$$\text{if } [P_6 \pi \leqq \theta < P_7 \pi \text{ , } \varepsilon > 0]$$

$$w(\theta) = 0$$

$$\text{if } [P_6 \pi \leqq \theta < P_7 \pi \text{ , } \varepsilon = 0]$$

$$w(\theta) = 0$$

$$\text{if } [P_7 \pi \leqq \theta],$$

and the respective parameters in the above formulas are determined by the following respective formulas:

[Formula 1B]

$V1 = \varepsilon - F + 2^{(N-1)}$ if $[\varepsilon - F + 2^{(N-1)} > 0]$

$V2 - \varepsilon / 2 - V1$

$M = 2^N$

$W1 = 1/2^N$

$W2 = 1/2^{(N-1)}$ if $[\varepsilon \leqq 0]$

$W2 = 2*W1$ if $[\varepsilon > 0, \ F < M]$

$W2 = (2*(M-F) + \varepsilon)*W1/\varepsilon + W1$ if $[\varepsilon > 0, \ M \leqq F]$

$AA = -F$

$BB = -F + \varepsilon$

$CC = M - F$

$DD = M - F + \varepsilon$

$EE = F - M - \varepsilon$

$FF = F - M$

$GG = F - \varepsilon$

$HH = F$

$Po = AA$

$P_1 = BB$ if $[F < M/2 + \varepsilon/2]$

$P_1 = EE$ if $[M/2 + \varepsilon/2 \leqq F < M/2 + \varepsilon]$

$P_1 = BB$ if $[M/2 + \varepsilon \leqq F]$

$P_2 = BB$ if $[M/2 + \varepsilon/2 \leqq F < M/2 + \varepsilon]$

$P_2 = EE$ if $[M/2 + \varepsilon \leqq F < M + \varepsilon/2]$

$P_2 = CC$ if $[M + \varepsilon/2 \leqq F]$

$P_3 = FF$ if $[M/2 + \varepsilon/2 \leqq F < M]$

$P_3 = CC$ if $[M \leqq F < M + \varepsilon/2]$

P₃=EE   if [M+ ε /2 ≦ F]

P₄=CC   if [M/2+ ε /2 ≦ F<M]

P₄=FF   if [M ≦ F<M+ ε /2]

P₄=DD   if [M+ ε /2 ≦ F]

P₅=GG   if [M/2+ ε /2 ≦ F<M/2+ ε]

P₅=DD   if [M/2+ ε ≦ F<M+ ε /2]

P₅=FF   if [M+ ε /2 ≦ F]

P₆=GG   if [F<M/2+ ε /2]

P₆=DD   if [M/2+ ε /2 ≦ F<M/2+ ε]

P₆=GG   if [M/2+ ε ≦ F]

P₇=HH.

[13] The tomogram reconstruction method according to claims 1 or 2, wherein weighting functions w (θ ,γ) for the fan beam reconstruction in the case that the projection phase of the fan beam is set as θ and the fan angle is set as γ , using N which can be obtained from the correction angle width ε π [rad] and $2^{(N-1)}$ ≦ F- ε /2<2^N (N is an integer of more than 0) are:

[Formula 2A]

w (θ)=0

                          if [θ < P₀π]

w (θ)=(P₇π + θ)W1/(ε π)

                          if [P₀π ≦ θ <P₁π , ε >0]

w (θ)=0

62

$$\text{if } [P_0\pi \leqq \theta < P_1\pi, \quad \varepsilon = 0]$$

$$w(\theta) = W1*V2*2/\varepsilon$$

$$\text{if } [P_1\pi \leqq \theta < P_2\pi, \quad \varepsilon > 0, V1 = 0]$$

$$w(\theta) = ((\theta - P_1\pi)*(W1*4/\varepsilon)/2\pi) + W1*V2*2/\varepsilon$$

$$\text{if } [P_1\pi \leqq \theta < P_2\pi, \quad \varepsilon > 0, V1 \neq 0]$$

$$w(\theta) = W1$$

$$\text{if } [P_1\pi \leqq \theta < P_2\pi, \quad \varepsilon = 0]$$

$$w(\theta) = W1$$

$$\text{if } [P_1\pi \leqq \theta < P_2\pi, \quad \varepsilon = 0]$$

$$w(\theta) = ((\theta - P_3\pi)*W1/(\varepsilon\ \pi)) + W2$$

$$\text{if } [P_2\pi \leqq \theta < P_3\pi, \quad \varepsilon > 0]$$

$$w(\theta) = W2$$

$$\text{if } [P_3\pi \leqq \theta < P_4\pi]$$

$$w(\theta) = ((P_4\pi - \theta)*W1/(\varepsilon\ \pi)) + W2$$

$$\text{if } [P_4\pi \leqq \theta < P_5\pi, \quad \varepsilon > 0]$$

$$w(\theta) = W1*V2*2/\varepsilon$$

$$\text{if } [P_5\pi \leqq \theta < P_6\pi, \quad \varepsilon > 0, V1 = 0]$$

$$w(\theta) = ((P6\pi - \theta)*(W1*4/\varepsilon)/2\pi) + W1*V2*2/\varepsilon$$

$$\text{if } [P_5\pi \leqq \theta < P_6\pi, \quad \varepsilon > 0, V1 \neq 0]$$

$$w(\theta) = W1$$

$$\text{if } [P_5\pi \leqq \theta < P_6\pi, \quad \varepsilon = 0]$$

$$w(\theta) = (P_7\pi - \theta)W1/(\varepsilon\ \pi)$$

$$\text{if } [P_6\pi \leqq \theta < P_7\pi, \quad \varepsilon > 0]$$

$$w(\theta) = 0$$

$$\text{if } [P_6\pi \leqq \theta < P_7\pi, \ \varepsilon = 0]$$

$w(\theta) = 0$

$$\text{if } [P_7\pi \leqq \theta],$$

and the respective parameters in the above formulas are determined by the following respective formulas:

[Formula 2B]

$V1 = \varepsilon - F + 2^{(N-1)}$ if $[\varepsilon - F + 2^{(N-1)} > 0]$

$V2 - \varepsilon/2 - V1$

$M = 2^N$

$W1 = 1/2^N$

$W2 = 1/2^{(N-1)}$ if $[\varepsilon \leqq 0]$

$W2 = 2*W1$ if $[\varepsilon > 0, \ F < M]$

$W2 = (2*(M-F) + \varepsilon)*W1/\varepsilon + W1$ if $[\varepsilon > 0, \ M \leqq F]$

$AA = -F$

$BB = -F + \varepsilon$

$CC = M - F$

$DD = M - F + \varepsilon$

$EE = F - M - \varepsilon$

$FF = F - M$

$GG = F - \varepsilon$

$HH = F$

$Po = AA$

$P_1 = BB$ if $[F < M/2 + \varepsilon/2]$

$P_1 = EE$ if $[M/2 + \varepsilon/2 \leqq F < M/2 + \varepsilon]$

64

P₁=BB   if [M/2+ ε ≦F]

P₂=BB   if [M/2+ ε /2≦F<M/2+ ε]

P₂=EE   if [M/2+ ε ≦F<M+ ε /2]

P₂=CC   if [M+ ε /2≦F]

P₃=FF   if [M/2+ ε /2≦F<M]

P₃=CC   if [M≦F<M+ ε /2]

P₃=EE   if [M+ ε /2≦F]

P₄=CC   if [M/2+ ε /2≦F<M]

P₄=FF   if [M≦F<M+ ε /2]

P₄=DD   if [M+ ε /2≦F]

P₅=GG   if [M/2+ ε /2≦F<M/2+ ε]

P₅=DD   if [M/2+ ε ≦F<M+ ε /2]

P₅=FF   if [M+ ε /2≦F]

P₆=GG   if [F<M/2+ ε /2]

P₆=DD   if [M/2+ ε /2≦F<M/2+ ε]

P₆=GG   if [M/2+ ε ≦F]

P₇=HH.

[14] The tomogram reconstruction method according to claim 1, wherein the projection data is detected as moving an object in the revolving axis direction along with the revolution of the radiation source and the detector, including a step for interpolating said projection data and creating the projection data of the side that is orthogonal to the revolving axis.

$P_1=BB$ if $[M/2+ \varepsilon \leqq F]$

$P_2=BB$ if $[M/2+ \varepsilon /2\leqq F<M/2+ \varepsilon]$

$P_2=EE$ if $[M/2+ \varepsilon \leqq F<M+ \varepsilon /2]$

$P_2=CC$ if $[M+ \varepsilon /2\leqq F]$

$P_3=FF$ if $[M/2+ \varepsilon /2\leqq F<M]$

$P_3=CC$ if $[M\leqq F<M+ \varepsilon /2]$

$P_3=EE$ if $[M+ \varepsilon /2\leqq F]$

$P_4=CC$ if $[M/2+ \varepsilon /2\leqq F<M]$

$P_4=FF$ if $[M\leqq F<M+ \varepsilon /2]$

$P_4=DD$ if $[M+ \varepsilon /2\leqq F]$

$P_5=GG$ if $[M/2+ \varepsilon /2\leqq F<M/2+ \varepsilon]$

$P_5=DD$ if $[M/2+ \varepsilon \leqq F<M+ \varepsilon /2]$

$P_5=FF$ if $[M+ \varepsilon /2\leqq F]$

$P_6=GG$ if $[F<M/2+ \varepsilon /2]$

$P_6=DD$ if $[M/2+ \varepsilon /2\leqq F<M/2+ \varepsilon]$

$P_6=GG$ if $[M/2+ \varepsilon \leqq F]$

$P_7=HH$.

[14] The tomogram reconstruction method according to claim 1, wherein the projection data is detected as moving an object in the revolving axis direction along with the revolution of the radiation source and the detector, including a step for interpolating said projection data and creating the projection data of the side that is orthogonal to the revolving axis.

[15] A tomograph comprising:

a radiation source and a detector disposed to be opposite to each other interposing a scanning object therebetween;

a reconstruction means for creating a tomogram of a region of interest of an object from the projection data being detected by the detector; and

an imaging control means for controlling the radiation source, the detector and the reconstruction means,

wherein the reconstruction means obtains the weighting factor according to the correction angle width and the projection data angle for back-projection of the projection data, further obtains the projection data by performing the weighting process based on said weighting factor and assigning the weight to said projection data, and reconstructs a tomogram using the weighted projection data.

[16] The tomograph according to claim 15, wherein the imaging controlling means takes images by widening the projection data angle for back-projection and improving SNR.

[17] The tomograph according to claim 15, wherein the imaging controlling means takes images by narrowing the projection data angle for back-projection and improving the time resolution.

[18]   The tomograph according to claim 15 including a means for moving an object relative to the radiation source and the detector, wherein the imaging controlling means changes the correction angle width and/or the projection data angle for back-projection according to the moving speed of the object.

[19]   The tomograph according to claim 15, wherein the detector is a multi-array detector, and the reconstruction means uses the same weighting factor on each row of the detector.

[20]   The tomograph according to claim 15, wherein the detector is a multi-array detector, and the reconstruction means uses, with regard to at least one row of the detector, a different weighting factor from other rows.

[21]   The tomograph according to claim 15 further comprising an input means for inputting the information from a user relating to the correction angle width and the projection data angle for back-projection.